
To: Stanley Wallin, P.E., Project Manager

From: Thomas W. Smith, P.E., G.E.

Date: December 29, 2005

Re: FINAL - 2005 Field Reconnaissance Memo, Sacramento River Erosion Site Inventory
Ayres Associates Project Number 32-0530.10, Task 3

1.0 INTRODUCTION AND BACKGROUND

Each year, personnel from the U.S. Army Corps of Engineers (Corps), Sacramento District, and their local sponsor, the California Department of Water Resources (DWR), conduct a field reconnaissance review of the Sacramento River Flood Control System. Since 1997, Ayres Associates has assisted the Corps and their local sponsors with this annual review and inventory of erosion sites. **Figure 1** shows the overall extent of waterways observed in this field review.

The purposes of this review are: a) to monitor and document the condition of previously identified erosion sites, b) inventory any new erosion sites and delete those that have been repaired and also, c) identify critical erosion sites that appear to be a more serious threat to the structural integrity of the flood control system.

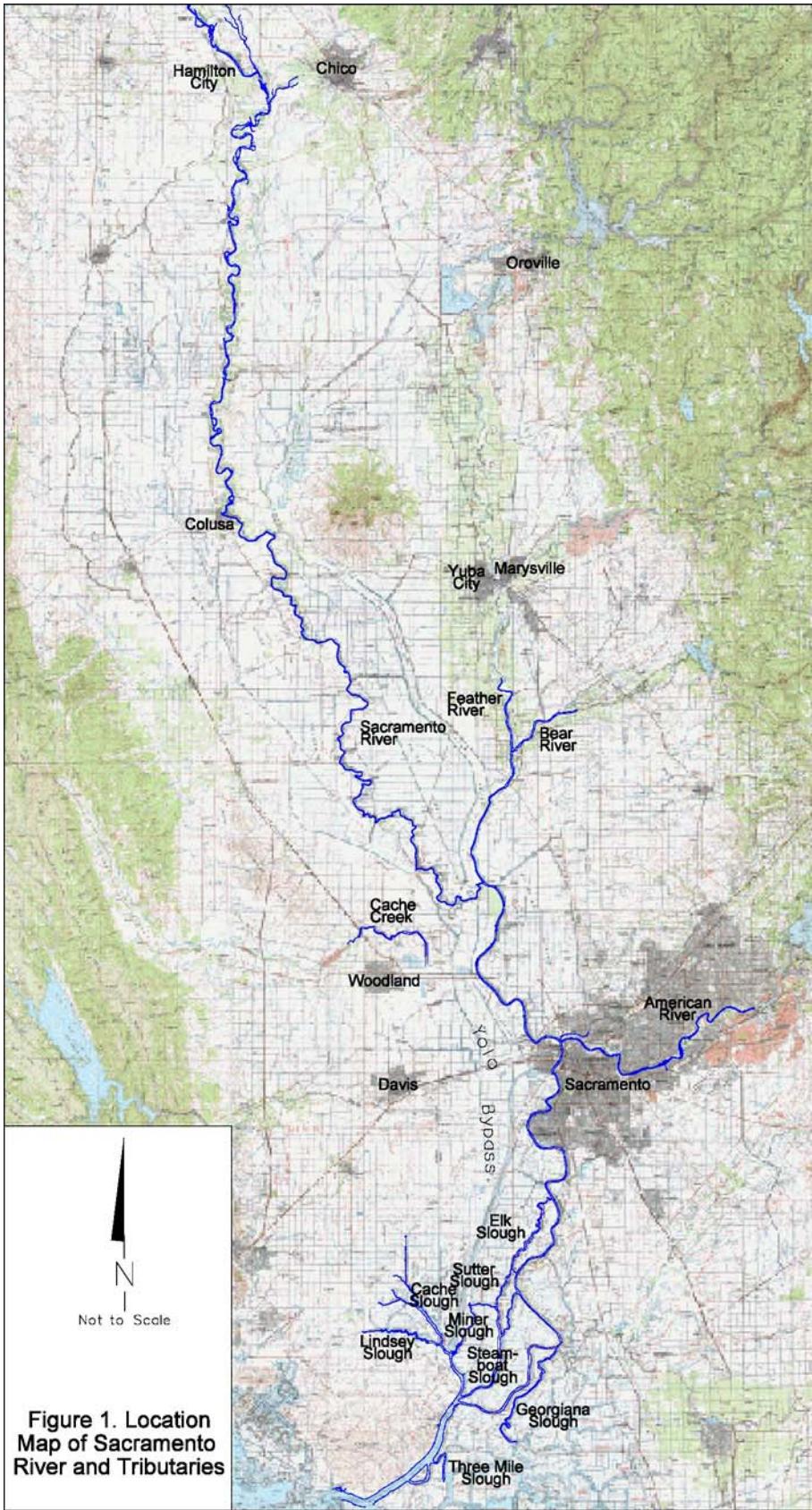
The specific criteria used to identify erosion sites within the system are described in a subsequent section of this report. In most cases the criteria are consistent from year to year and are based on bank and levee conditions that are threatening the function of the flood control system. An **erosion site** is defined as:

A site that is at risk of an erosional failure during floods and/or normal flow conditions; the term “critical” and “potentially critical” are used to indicate erosion sites that are of the highest priority.

The project team identifies erosion sites as being critical based on familiarity with the mechanics of the river system and experience with levee failures by erosion.

2.0 AUTHORIZATION AND WORK REQUIREMENTS

Ayres Associates' work requirements for this project are set forth in the Supplemental Scope of Work (SSOW) issued on July 21, 2004, under Contract DACW05-02-D-0002. The Project Manager at the Sacramento District was Mr. Stanley Wallin, P.E. and the technical point of contact was Mr. Mark Boedker, P.E. in the Engineering Division, Civil Design Section.



Prior to the field reconnaissance, a master list of all 2004 erosion sites within the Sacramento River Flood Control System was prepared by Ayres Associates for use by those participating in the review. The list contained the approximate position, located during previous reconnaissance trips and pertinent data associated with the characteristics of each erosion site. The list was used by Ayres Associates personnel to identify past erosion sites. Ayres Associates was also required to identify any new erosion sites and add them to the inventory. New sites identified during the field inspection were located using a portable Global Positioning System (GPS) receiver. Digital photos were provided for the existing and newly identified erosion sites under a separate submittal to the Corps.

In addition to the inventory list, the 2003 Aerial Atlas of Bank Erosion Sites was used to aid in the 2005 field review. This atlas contained aerial photographs of the Sacramento River, from RM 0 to RM 197, as well as the disbutaries of the Sacramento River reviewed during this reconnaissance. Those maps showed all of the erosion sites from the 2003 inventory.

3.0 FIELD RECONNAISSANCE COVERAGE AND PROCEDURES

The field reconnaissance of the Sacramento River Flood Control System was conducted by boat during a 5-day period extending from October 24-28, 2005. Sacramento District Corps and California DWR personnel accompanied Ayres Associates personnel. The areas covered included:

- Main Sacramento River from Collinsville (RM 4) to Chico Landing (RM 199)
- Steamboat Slough
- Sutter Slough
- Portions of Lindsey Sloughs
- Cache Slough
- Georgiana Slough
- Threemile Slough
- Miner Slough
- Feather River (RM 0 to RM 25)

The Lower American River was not field reviewed as part of this task order. However, all Lower American River erosion sites from the previous inventory have been carried over and updated based on known repair progress. These sites were originally identified in a separate report entitled Lower American River – Erosion Susceptibility Analysis For Infrequent Flood Events (Ayres Associates, 2004).

An inspection of the Bear River was not completed in 2005 and no updated information is available. The information and observations from the 2002 report have been carried over. Cache Creek was also not inspected as part of this scope, but information from a Sacramento District field inspection report dated October 14, 2005 was incorporated.

The field reconnaissance was performed along the rivers and sloughs using a 17-foot boat powered by a 75-Hp prop-driven motor in most of the system. A 16-foot boat with a 50-Hp jet-driven motor was used in the upper reaches of the Sacramento River above Colusa and on the Feather River where a shallow draft boat was required.

Erosion site positions were located and new positional information was logged using a portable Eagle® UltraMap™ GPS receiver. Specific sites are identified by waypoints, and recorded on the GPS receiver by latitude and longitude. Previously identified sites (Ayres Associates 2004) were

located by navigating via the GPS receiver to the waypoints associated with that particular site. New positions were located by setting new waypoints on the GPS receiver.

The lengths of new sites were estimated visually and the river mile locations were estimated using the Sacramento River, 1991 Aerial Atlas (US Army, 1991).

4.0 EROSION INVENTORY CRITERIA AND SITE DATA COLLECTED

The criteria for including a bank erosion site into the inventory included some judgement as to the severity of the erosion and the threat to the levee but most always included one of the following two items:

- a) Bank erosion into the projection of the levee slope,
- b) Berm width of less than 35 feet (original criteria was 10 meters)

Figure 2 shows a schematic illustrating these two criteria.

Specific data collected at each site includes:

- a) Approximate River Mile as per 1991 Corps River Atlas
- b) Right or left bank
- c) GPS Waypoint designation
- d) Estimate site length (visual estimate)
- e) Erosion location on the bank (toe, mid bank, upper slope, etc.)
- f) Erosion mechanism
- g) Existing revetment type, if any
- h) Proximity of erosion to the levee slope
- i) Remaining berm width
- j) Field notes or comments for current inspection year.

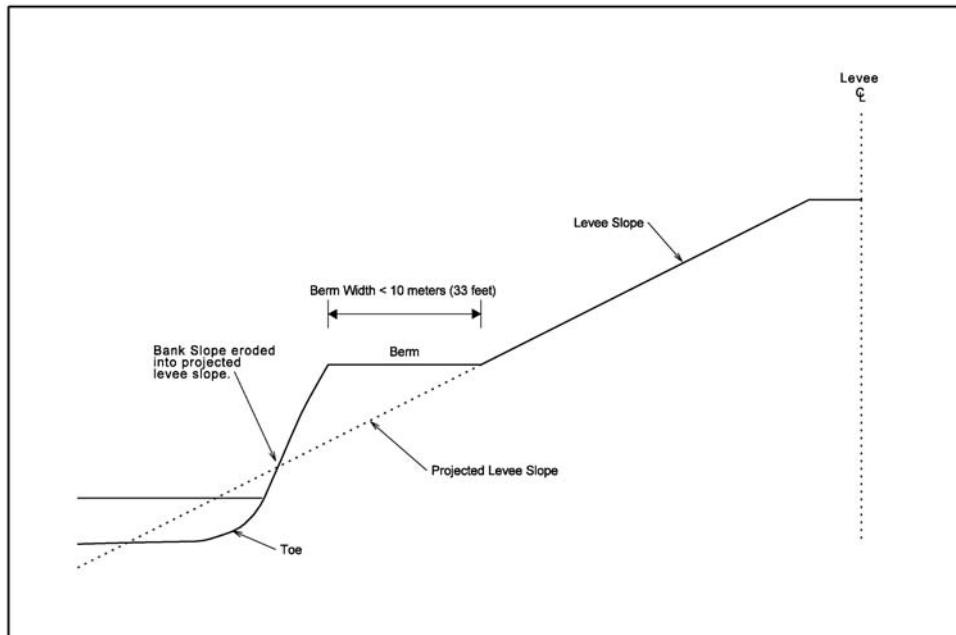


Figure 2. Schematic of Inventory Erosion site Criteria

5.0 SUMMARY OF 2005 FIELD RECONNAISSANCE OBSERVATIONS

Based upon the results of the 2005 reconnaissance inventory, the number of documented erosion sites within the Sacramento River Flood Control System is now at 174. This is eleven (11) less than in 2004. Twenty-two (22) sites have been removed and eleven (11) new sites have been added. The added sites are areas of new erosion or areas that had minor erosion before and have grown large enough to meet the criteria to be included in the inventory. The deleted sites include those that have been repaired and some that, upon closer review, did not met the basic criteria for inclusion into this inventory. The number of critical and potentially critical sites have decreased from 40 to 36 primarily due to repairs

The total number of 2005 erosion sites by river, stream or slough and changes from the 2004 inventory are summarized in the table below.

Summary of Erosion Sites by River, Creek and Slough

River, Creek or Slough	2004 Erosion Sites	2005 Erosion Sites	Sites Added in 2005	Sites Deleted in 2005	Critical ¹ Sites in 2004	Critical ¹ Sites in 2005
Bear River	3 ²	3 ²	0	0	2 ²	2 ²
Cache Creek	10 ⁴	10 ⁴	0	0	4 ⁴	3 ⁴
Cache Slough	1	4	3	0	1	1
Elk Slough	1	1	0	0	0	0
Feather River	8	8	0	0	2	2
Georgiana Slough	32	29	0	3	0	0
Lower American River	12 ³	4 ³	0	8	2 ³	0 ³
Sacramento River	106	102 ⁵	7	11	29	27 ⁵
Steamboat Slough	8	9	1	0	0	1
Sutter Slough	4	4	0	0	0	0
Totals	185	174	11	22	40	36

¹ This includes Critical and Potentially Critical classifications.

² The Bear River was not inspected in 2005 and the numbers from the 2002 inventory have been carried forward.

³ The Lower American River numbers are from a separate report (Ayres Associates, 2004), which looked at erosion potential for the 100-year runoff event and have been updated to reflect the sites that have been recently repaired.

⁴ Cache Creek was not inspected in 2005 and this number is based on an inspection report by the Corps of Engineers dated 10/14/05.

⁵ Many of the sites between RM 49 and RM 58 are scheduled for repair in 2006.

Many of the inventoried sites showed some increase in the amount of erosion, but in general the observed conditions were similar to last year mainly because of a moderate runoff season within the inventoried rivers and sloughs.

Many of the Georgiana Slough erosion sites are being repaired with "Brush Box" type methods. While there is some visual improvement in the growth of bank vegetation behind the revetments, almost all of these sites are still listed in the inventory, since the long-term viability of this methodology has not been documented. Many of these sites are currently being refreshed with new brush materials. More time and perhaps further studies are needed to establish how well this more environmentally friendly methodology will be able to provide the needed long-term bank protection.

Spreadsheets containing site observations for the inventoried erosion sites have been organized into tables as described below and are included in the **Appendix** to this memo.

Tables of Inventoried Erosion Sites for 2005 Located in Appendix

Table No.	Title	No. of sites
1	Sacramento River Levee System - Current Erosion Sites – 2005	174
2	Sacramento River Levee System - Newly Identifies Erosion Sites - 2005	11
3	Sacramento River Levee System - Removed Erosion Sites - 2005	22
4	Sacramento River Levee System - Potentially Critical and Critical Erosion Sites – 2005	36
5	Sacramento River Levee System - GPS Waypoint Locations	N/A

A general explanation of the terminology used throughout these tables to describe the condition of the different sites is as follows:

- Critical Site: Sites where further erosion may result in a bank failure, which encroaches near or into the levee crown and is recommended as the highest priority for repair.
- Potentially Critical Site: If the erosion pattern continues, the site will become a critical site.
- Monitor Closely: Denotes sites that are not currently at a potentially critical stage but may become so in the near future if the current erosion rate continues.
- Maintenance Site: Sites that contain small pockets of erosion that can be handled by maintenance activities and a project level approach is not recommended to complete the repair.

The critical and potentially critical sites have been classified in the field based on the combined experience and knowledge of the review team in the field. Actual measurements of erosions rates or bank cross sections were not available for this field classification. However, additional field data and specific site information would be helpful in refining the risk and establishing a priority ranking (Ayres Associates, 2005)

6.0 CONCLUSIONS

Based upon our observations from this field reconnaissance and our previous experience on the Sacramento River Flood Control System, we offer the following conclusions:

1. Bank erosion within the Sacramento River Flood Control System continues to be a serious threat to the integrity of the levees. While the observed conditions have not changed drastically over the past runoff season, the overall condition of most erosion sites continues to worsen in a slow, steady fashion.
2. None of the sites are healing themselves, with the possible exception of RM 130.8R where the river meander pattern may eventually bypass the entire site. However, this is still a critical site where the river has eroded into the projection of the waterside levee slope. Further erosion and damage to the levee is likely to occur before the meander pattern completely bypasses the site.
3. The total number of inventoried sites decreased by eleven (11) for a total of 174 sites for all waterways inventoried. A total of 11 new erosion sites were added and 22 existing sites removed as a result of repairs and reclassifications.
4. The number of sites characterized as "Critical" and "Potentially Critical" has also decreased. There were 40 in 2004 and now 36 in 2005. The overall reduction of four sites was the result of five repairs, one reclassification to just an erosion site and two new critical sites. The 2003, 2002 and 2001 inventories listed 36, 24 and 17 sites, respectfully.
5. While progress has been made in the past year, there are still 36 critical sites that are deemed the highest priority for repair and another 138 sites that require some repair attention. At the present rate of repair, it is probable that a significant runoff event (10-year or greater) will occur before all sites can be addressed and a levee failure is possible.
6. While some maintenance is being performed throughout the system, the inventory shows that many of the erosion sites continue to be neglected. Maintenance and repair costs will increase greatly as the waterside berms are eroded away and bank erosion eventually reaches the levee prism. If repairs are performed early while adequate berm width remains, then only the effects of bank erosion and toe scour need to be addressed in the repair. However, when erosion reaches near the levee prism, the additional structural issues of levee slope stability and under seepage become significant design issues and add greatly to the cost of the repair.
7. The review team agrees that additional field data is needed to more accurately assess each erosion site. Surveyed cross sections along with a more detailed ranking methodology that addresses a greater number of factors would provide a more objective ranking of the critical and potentially critical sites for the establishment of priorities for repair.
8. This inventory should not be thought of as the only locations where failures within the system could occur. This inventory is limited to what is visible above the waterline. New erosion sites can develop with each new runoff event. Other factors including below water scour and geotechnical problems such as large slope failures along with potential seepage and piping problems can also lead to levee failures.

9. Repair work continues to be difficult to complete on the Sacramento River but some progress is being made as evidenced by the number of sites that have been repaired. Relying on emergency action as the last line of defense for the remaining listed erosion sites will be difficult because of the high number of sites. The role of visually monitoring all of the erosion sites and the ability to provide early warning in the event of damage or a failure will become more critical.
10. The biotechnical repairs (Brush Boxes) on Georgiana Slough are helping to prevent further damage at many of these sites. There is noted improvements in the bank vegetation density at sites where the brush materials have been in place for several years. However, some of the repairs have not performed well and are already being rebuilt by installing new brush materials and poles. The long-term stability of this repair method is uncertain at this time.

7.0 RECOMMENDATIONS

Based upon our field reconnaissance and conclusions above, we offer the following recommendations:

1. The potentially critical and critical inventory sites are recommended as the highest priority for repair.
2. In order to further define the risk at the critical sites, each one should be field surveyed to develop a complete cross section of the entire overbank and underwater areas. This erosion reconnaissance only reviews the above water portion of the levee and riverbank. Surveying the underwater portion would help in assessing slope stability and seepage risks which are two mechanisms that have contributed to recent failures in the Sacramento system (Feather River and Sutter Bypass, 1997; Yuba River, 1986).
3. The Critical and Potentially Critical sites should be ranked using the four methodologies presented in the Priority Site Ranking Report (Ayres Associates, 2005). This will provide an indicator for prioritizing the sites for repair. The final ranking priority should be a joint effort between the Corps, DWR and the Maintaining Agency and/or Local Sponsor.
4. With bank protection projects taking many years to complete, a renewed emphasis should be placed on the identification of the agencies responsible for performing maintenance activities and distributing of a copy of this report to each. The design life of the non-critical erosion sites may be extended by the performance of maintenance activities.
5. It is very likely that severe damage and possibly a failure will occur at one or more of the potentially critical and critical erosion sites when the next high flow period occurs. Responsible agencies should be identified and designs prepared for emergency responses. Existing monitoring procedures during runoff events (bankfull and greater) should be reviewed for adequacy to insure there is enough warning time for implementing emergency repairs.
6. Further study and analysis of the "Brush Box" repairs on Georgiana Slough should be completed to verify their long-term effectiveness and possible use for other sites within the system.

8.0 REFERENCES

Ayres Associates Inc, 2003, Field Reconnaissance Report of Bank Erosion Sites, Sacramento River Flood Control Levees and Tributaries, Prepared for US Army, Corps of Engineers, March 2004

Ayres Associates Inc, 2003, Sacramento River Bank Protection Project, Sacramento River and Distributaries, Aerial Atlas of Bank Erosion Sites, Prepared for US Army, Corps of Engineers, Sacramento District, California, September 2003.

Ayres Associates Inc, 2004, Lower American River, Erosion Susceptibility Analysis for Infrequent Flood Events, Prepared for US Army, Corps of Engineers, Sacramento District, July 2004.

Ayres Associates Inc, 2004, Field Reconnaissance Report of Bank Erosion Sites, Sacramento River Bank Protection Project, Prepared for US Army, Corps of Engineers, November 2002.

Ayres Associates Inc, 2005, Draft–Priority Site Ranking for Critical Erosion Sites on the Sacramento River Flood Control Levees Using multiple Ranking Methodologies, Prepared for US Army, Corps of Engineers, September 2005.

US Army, Corps of Engineers, 1991 Aerial Atlas, Collinsville to Shasta Dam, Sacramento River, Sloughs, and Tributaries, California, July 15, 1991.

US Army, Corps of Engineers, 2004, City and County of Sacramento, American and Sacramento Rivers – FEMA Certification Project, List of Erosion Sites, January 2004.

US Army, Corps of Engineers, 2005, Memorandum for File, “Sacramento River Bank Protection Project; Cache Creek Field Reconnaissance”, Prepared by Sacramento District, 14 October 2005.

APPENDIX

TABLE 1 - Sacramento River Levee System - Current Erosion Sites - 2005

TABLE 2 - Sacramento River Levee System - Newly Identified Erosion Sites - 2005

TABLE 3 - Sacramento River Levee System - Removed Erosion Sites - 2005

TABLE 4 - Sacramento River Levee System - Potentially Critical and Critical Erosion Sites –2005

TABLE 5 - Sacramento River Levee System - GPS Waypoint Locations

Table 1. Sacramento River Levee System - Current Erosion Sites

2005 SACRAMENTO RIVER RECONNAISSANCE EROSION INVENTORY
Includes Inventoried Erosion Sites from 1997-2004 (Revised)

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Bear	2.4	Left	115*	114*		152	Berm	Toe Erosion, Upper Bank Slope	None	Near	50	DID NOT OBSERVE. (2002 Note: Part of existing site; Sandy banks are actively eroding and has worsened since last year.)	***CRITICAL***
Bear	9.9	Right	117*	118*		152	Upper Bank	Toe Erosion, Upper Bank Slope	Riprap	Near	0-30	DID NOT OBSERVE. (2002 Note: No berm to about 10'; Site has been rocked, upper bank rocked but is sliding down; There are two erosion scallops at toe of slope.)	---
Bear	10.1	Right	116*	117*		213	Berm	Toe Erosion, Upper Bank Slope	None	Near	0	DID NOT OBSERVE. (2002 Note: No berm; 1:1 OR 1.5:1 slope from toe of levee to river bottom; No rock protection.)	***CRITICAL***
Cache Creek	LM 0.8	Right	75*	72*		1100	Bank Slope	Toe Erosion, Upper Bank Collapse	None	Near	140	DID NOT OBSERVE.	---
Cache Creek	LM 0.8	Left			76*	350	Bank Slope	Toe Erosion, Upper Bank Collapse	None	Near	60	DID NOT OBSERVE. (2002 Note: Erosion extends 150' US and 200' DS of WPT.)	---
Cache Creek	LM 1.1	Left			85*	525	Bank Slope	Toe Erosion, Upper Bank Collapse	None	Near	90	DID NOT OBSERVE. (2002 Note: Erosion extends 150' US and 375' DS of WPT.)	---
Cache Creek	LM 1.8	Right	68*	63*		249	Bank Slope	Toe Erosion, Upper Bank Collapse	None	Near	160	DID NOT OBSERVE.	---
Cache Creek	LM 2.4	Left			86*	570	Bank Slope	Toe Erosion, Upper Bank Collapse	None	Near	90	DID NOT OBSERVE. (2002 Note: Erosion extends 240' US and 3300' DS of Wpt.)	---
Cache Creek	LM 2.8	Left			87*		1100	Bank Slope	Toe Erosion, Upper Bank Collapse	None	130	DID NOT OBSERVE.	---
Cache Creek	LM 3.4	Left			106*	470	Bank Slope	Toe Erosion, Upper Bank Collapse	None	Near	165	DID NOT OBSERVE. (2002 Note: Erosion extends 200' US and 270' DS of Wpt.)	---
Cache Creek	LM 3.6	Right			62*	200	Bank Slope	Toe Erosion, Upper Bank Collapse	None	Near	60	<u>Removed from Critical list-see Corps Inspection Memo of 10/13/05</u> DID NOT OBSERVE.	---
Cache Creek	LM 3.9	Left			107*	350	Bank Slope	Toe Erosion, Upper Bank Collapse	None	Near	130	DID NOT OBSERVE. (2002 Note: Erosion extends 200' US and 150' DS of Wpt.)	---
Cache Creek	LM 4.2	Left			112*	710	Bank Slope	Toe Erosion, Upper Bank Collapse	None	Near	130	DID NOT OBSERVE. (2002 Note: Erosion extends 360' US and 350' DS of Wpt.)	---

Table 1. Sacramento River Levee System - Current Erosion Sites

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Cache Slough	15.5	Left		366	10	Scallop	Wave wash	New stone failing in places	In	1-2	<u>NEW SITE</u> - Large vertical sections due to wave wash. New stone dumped on bank with geotextile exposed. Cohesive toe has thin weak stratigraphic unit that is washing out. Poor design/construction of stone revetment.	D4P13	
Cache Slough	15.9	Left	364	365	300	Toe	Wave wash	New stone failing in places	In	1-2	<u>NEW SITE</u> - Large vertical sections due to wave wash. New stone dumped on bank with geotextile exposed. Cohesive toe has thin weak stratigraphic unit that is washing out.	D4P11 D4P12	
Cache Slough	21.8	Right	551	552	363 (at 10m pocket)	485 (?)	Whole Bank and toe	Rotational failure, fluvial toe erosion	None	In	0	Reach is not 485m long, mainly numerous small pockets. Still looks bad. No grass on levee slopes now (has been graded). ***CRITICAL***	D4P9 at 10m pocket at D/S end WPT
Cache Slough	23.6	Right			135	400	Scallops and toe	Wave wash and geotechnical failures	None	In	0	<u>NEW SITE</u> (This site appears on atlas and waypoint is in GFS, but is not in inventory - need to put back into inventory)	D4P10 at D/S end
Elk Slough		Both			40	(10 each)	Levee slope	Mass failure	None	In	0	No Observed changes. Both banks are still oversteepened in most places and potentially susceptible to geotechnical failures.	D4P8 of left bank
Feather	0.6	Left			522	10	Toe	Scour	Cobble	In	5	No Observed changes.	D5P1
Feather	1	Left	531		532	200	Toe	Scour	None	Near	5	No observed changes.	D5P2
Feather	3.5	Left			217	15	Whole Bank	Rotational Failure	None	Near	< 8	Some additional slope erosion and a tree from slope has fallen into water.	D5P3
Feather	5	Left	13	12	60	150	Berm	Fluvial	None	>10m	>10m	No observed changes.	D5P4
Feather	7	Left	526		525	125	Toe, Levee slope	Fluvial	Cobble	In		Small amount of additional erosion at waterline. No other observed changes	D5P5
Feather	17.8	Left			553	75-100	Whole Bank	Fluvial, Slope failures	None	Near	>50	Some new slumping. Actively eroding wide berm which is >50 feet wide. ***POTENTIALLY CRITICAL***	D5P6 D5P7

Table 1. Sacramento River Levee System - Current Erosion Sites

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Feather	19.7	Left		554	100	Whole Bank	Fluvial, Slope failures	None	Near	>50		***POTENTIALLY CRITICAL*** No observed changes (large berm)	D5P8
Feather	37.9	Right			610			None	Near			DID NOT OBSERVE.	---
Georgiana Slough	0.3	Left	432	431	390	Repaired	Repaired	None	In			Most brush boxes are devoid of brush bundles. Some pockets are filled with new stone. No other observed changes.	D4P17
Georgiana Slough	1.7	Left	441	440	320	Toe	Pocket erosion	Rock riprap	In			Some new brush bundles in brush boxes. No other observed changes.	D4P19 at D/S end
Georgiana Slough	2.3	Left	444	442	443	360	Toe, Levee slope	Pocket erosion	Some rock riprap (dumped)	In		Brush boxes don't appear to be working in several places. No other observed changes.	D4P21 at D/S end D4P22 at U/S end
Georgiana Slough	2.5	Left	446	445	100	Toe	Erosion pockets	None	In			Some new brush bundles in brush boxes. No other observed changes.	D4P23
Georgiana Slough	3.6	Left	450	449	365	Levee slope	Erosion pockets	None	In			Some new brush bundles in brush boxes. No other observed changes.	D4P24
Georgiana Slough	3.7	Left	452	451	35	Toe	Erosion pockets	None	In			Some new brush bundles in brush boxes. No other observed changes.	D4P25
Georgiana Slough	3.7	Left			453	10	Toe	Local pocket	None	In		Some new brush bundles in brush boxes. No other observed changes.	D4P26
Georgiana Slough	4	Left	455	454	145	Levee	Fluvial	Rock riprap	In			New brush boxes installed. No other observed changes.	D4P27 D4P28

Table 1. Sacramento River Levee System - Current Erosion Sites

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Georgiana Slough	4.3	Left	458	456	457	280	Toe	Erosion pockets	Rock riprap	In		Some new brush boxes installed. Some boxes are devoid of brush bundles. Levee slopes and banks still look bad with pocket scallops into levee slopes.	D4P29 D4P30 D4P31
Georgiana Slough	4.5	Left	460	368	459	150	Toe	Wave wash and Pocket erosion	None	In	0	Revised - Extended reach from downstream side of bridge. Whole bank is vertical. No other observed changes.	D4 P32
Georgiana Slough	4.6	Left	461	460		305	Toe	Pocket erosion	None	In		No observed changes	D4P33
Georgiana Slough	5.3	Left	465	464		940	Levee slope	Erosion pockets	None	In		Some new brush bundles in brush boxes. Some boxes missing brush bundles. Some boxes too low relative to high tide. No other observed changes.	D4P35 at D/S end D4P36 at middle D4P37 at U/S end
Georgiana Slough	6.1	Left	416	417		560	Levee toe, Berm slope	Deep pockets	Some rock riprap (in spots)	In	3	Some new brush bundles in brush boxes. Some boxes missing brush bundles. Some boxes too low relative to high tide. No other observed changes.	D4P38 at U/S end
Georgiana Slough	6.4	Left	413	415		160	Repaired	Repaired	None	In	3	No observed changes.	D4P39
Georgiana Slough	6.6	Left	411	412		120	Levee	Deep pockets	None	In		Some stone sliding off underlying geotextile fabric. No other observed changes.	D4P40
Georgiana Slough	6.8	Left	409	410		350	Levee slope	Deep pockets	None	In	5	No observed changes.	D4P41 at D/S end

Table 1. Sacramento River Levee System - Current Erosion Sites

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Georgiana Slough	7	Right	407	408		165	Toe	Scour	Rock riprap	In		Stone revetment in between pockets. No other observed changes.	D4P42 at U/S end
Georgiana Slough	7.3	Left	404	405		165	Levee	Large pocket	None	In		No observed changes.	D4P43
Georgiana Slough	7.7	Right			403	10	Repaired	Repaired	None	Near	7	Some new brush boxes. No other observed changes.	D4P44
Georgiana Slough	8.1	Right	399	400		70	Levee toe, Berm slope	Erosion pockets	Rock riprap	In	3	No observed changes.	D4P45
Georgiana Slough	8.3	Left	397	398		40	Levee slope	Fluvial	None	In	5	No observed changes.	D4P46
Georgiana Slough	8.4	Left	395	396		300	Levee slope	Erosion pockets	None	In	5	No observed changes.	D4P47 at D/S end
Georgiana Slough	8.7	Left	393	394		35	Levee toe, Berm slope	Fluvial, some deeper pockets	None	In	9	No observed changes.	D4P48

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River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Georgiana Slough	9.3	Left	387	388	200	Levee	Fluvial	Rock riprap	In	Upstream 200 feet removed because of presence of wide berm. No other observed changes.		D4P50	
Georgiana Slough	10.3	Left	381	382	75	Levee toe, Berm slope	Fluvial	None	In	5	No observed changes.		D4P51
Georgiana Slough	10.4	Left	379	380	70	Levee toe, Berm slope	Fluvial	None	In	3	No observed changes.		D4P52
Georgiana Slough	10.6	Left	377	378	95	Levee	Fluvial	None	In		No observed changes.		D4P53
Georgiana Slough	10.9	Left	375	376	105	Berm or Levee slope	Fluvial	None	In or near	9	No observed changes.		D4P54
Georgiana Slough	11.6	Left	373	374	195	Levee toe, Berm slope	Fluvial	None	In	4	No observed changes.		D4P55
Lower American	2.5	Left				Levee Slope	erosion of waterside slope				DID NOT OBSERVE.		---
Lower American	8	Right				Levee Slope	erosion of waterside slope				DID NOT OBSERVE. (2003 Note: Site classified as a FEMA erosion site from the Ayres, July 2004.)		---
Lower American	9	Right				Slope, Toe	slope and toe erosion, then slope failure				DID NOT OBSERVE. (2003 Note: Site classified as a FEMA erosion site from the Ayres Associates, July 2004 Report.)		---
Lower American	9.7	Left				1530			None	Near	DID NOT OBSERVE. (2003 Note: Site classified as a FEMA erosion site from the Ayres Associates, July 2004 Report.)		---
Sacramento	8	Left				243	150	Levee slope	Waves, Drawdown	Riprap - low		Revised limits - Extended reach because of vertical bank along roadway upstream. No other observed changes.	D4P16
Sacramento	10.8	Left	216	214	500	Mid-bank	Wave Wash	Rock Riprap at Toe	In	0	Spot repaired, but still have eroding toe in several places.		D4P15
Sacramento	20.8	Left	472	473	120	Partially Repaired	None	Partially Repaired	In		Some new erosion into levee section. No other observed changes.		D3P62 at U/S end
Sacramento	21.5	Left	470	471	65	Partially Repaired	Partially Repaired	Rock riprap	In		No observed changes.		D3P61
Sacramento	22.5	Left	293	292	260	Berm	Fluvial, Mass failure, Wave wash		Near	3	Some new minor stone revetment at upstream end. Brush boxes present. No other observed changes.		D3P59 D3P60 at D/S end

Table 1. Sacramento River Levee System - Current Erosion Sites

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Sacramento	22.7	Left	295	294		65	Berm	Fluvial, Mass failure, Wave wash		Near	0	Brush boxes present. No other observed changes.	D3P58
Sacramento	23.2	Left	297	296		145	Berm	Mass failure, Fluvial, Wave wash		Near	3	Empty brush boxes present. No other observed changes. Large berm is present.	D3P56 at U/S end D3P57 at D/S end
Sacramento	23.3	Left	299	298		50	Berm	Mass failure, Fluvial, Wave wash		Near	10-15	Brush boxes present. No other observed changes. Large berm is present.	D3P55
Sacramento	24.8	Left	534	300		115	Berm slope	Mass failure, Fluvial, Wave wash		In	3	Brush boxes present. No other observed changes.	D3P54 at U/S end
Sacramento	25.2	Left	536	56	535	Variable	Berm slope	Mass failure, Fluvial, Wave wash	Rock riprap	Near		Brush boxes present. No other observed changes.	D3P53 at middle
Sacramento	26	Left	466	467		420	Partially Repaired	Partially Repaired		In at D/S end	0-15	Lots of old brush boxes, some with established vegetation in area behind box. No other observed changes.	D3P51 at U/S end D3P52 at D/S end
Sacramento	26.5	Left	103	102		140	Toe, Levee slope	Toe scour	Riprap	In		***POTENTIALLY CRITICAL*** No observed changes.	D3P 46 at U/S end D3P47 at D/S end
Sacramento	26.9	Left	105	104		85	Toe	Toe scour	Cobble	In	0	***CRITICAL- 42F SITE*** Currently trimming trees and clearing bank. Still looks bad.	D3P45
Sacramento	31.6	Right	236	238		100	Levee slope	Fluvial	Riprap	In		Downstream 100-125m have been repaired. No other observed changes.	D3P43 at U/S end
Sacramento	32.5	Right	276	277		565	Toe, Levee slope	Fluvial, Mass failure	Intermittent rock riprap, concrete rubble	In	0	Looks worse at the upstream end because of road work along the top of the slope. Downstream end appears about the same. No other observed changes at downstream end	D3P42 at U/S end
Sacramento	33	Right	557	274		100	Toe, Lower bank slope	Tree popouts, Rotational failures, wave wash	Rock Riprap	In	0	Looks worse because vegetation disturbance has damaged surface soils and resulted in dry ravel of sandy slope.	D3P41
Sacramento	34.5	Right	231	232		130	Partially Repaired	Concrete rubble	Concrete rubble	In		***CRITICAL*** Upstream end has been repaired, but rock is sliding off the cohesive bench at the waterline. Downstream end is not repaired.	See 2004 D3P34

Table 1. Sacramento River Levee System - Current Erosion Sites

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Sacramento	35.4	Right			273	100	Pocket, Toe	Wave wash, Tree popouts	Riprap	In	0	NEW SITE - Three pockets of erosion into levee section due to popouts or mass failures. Stone is present along waterline. Riprap is present upstream and downstream of site.	D3P40
Sacramento	35.4	Left	250	247	40	Toe, Lower bank slope	Eddy and wave wash	Rock Riprap (?)	In	0-3	Looks a little worse. Two major holes with vertical banks and smaller intermittent pockets in between. Stone is present upstream, downstream and at toe.	D3P38 at U/S end D3P39 at D/S end	
Sacramento	38.5	Right	219	218	75	Partially Repaired	Partially Repaired	Riprap	In		No observed changes.	D3P37 at U/S & D3P36	
Sacramento	41.9	Right	360	215	400	Structural problem	Mass Failures	Cobble (short section)	In		New brush boxes at waterline for several hundred feet downstream. No toe or bank protection present. No other observed changes.	D3P32 D3P33	
Sacramento	43.3	Right	210	213	325	Levee slope	Fluvial	Concrete rubble, rock, and cobble	In	0	Lots of new nearly full bank stone riprap protection in spots. Site is no longer critical and has been removed from that list, but still need to be monitored since there are some unprotected pockets.	D3P30 view D/S D3P31 at middle	
Sacramento	43.7	Right	208	209	340	Partially Repaired D/S; Toe, Levee slope	Partially Repaired D/S; Fluvial at U/S 20m section	None D/S; Rock riprap at 20m U/S end	In		No observed changes.	D3P29 at U/S end	
Sacramento	44.7	Right	206	207	430	Partially Repaired	Partially Repaired	None	In		Some new erosion in pockets and caves under trees are exposed.	D3P28 at U/S end	
Sacramento	47.0	Left			246	300	Toe, berm	Fluvial, wave wash	None	In	2-3	NEW SITE - Long reach with eroding vertical silty-sandy berm. Erosion may be into levee toe. No riprap at site but have cobble riprap upstream and rock riprap downstream. Site is just downstream of a stormwater outfall.	D3P27 view D/S
Sacramento	47.9	Right	202		30	Toe, Levee slope	Toe scour	Riprap	In		No observed changes.	D3P26	

Table 1. Sacramento River Levee System - Current Erosion Sites

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Sacramento	48.2	Right		201	20	Toe	Toe scour	Riprap	In			No observed changes.	D3P25
Sacramento	49.6	Left		39	50	Toe, Berm	Fluvial	None	Near	3		***CRITICAL*** No observed changes.	See 2004 D3P21
Sacramento	49.7	Left		359	180	Toe, Berm	Fluvial	None	Very close	5		Revised - Reach should be extended about 100-200m further downstream (to RM 49.6).	D3P24
Sacramento	49.9	Left			198	10	Repaired	Riprap	In			***CRITICAL*** No observed changes. Consists mainly of undercut trees with rock riprap upstream and downstream.	D3P23
Sacramento	50	Left		239	approx. 450	Toe, berm, pockets	Fluvial, wave wash	None	Near	9-10		NEW SITE - Eroding wide, sandy-silty berm with vertical face in places and erosion potholes into the berm. There is no revetment in the reach, but there is lots of woody debris along the waterline. Apparent reach = RM 50.2 - RM 49.9.	D3P21
Sacramento	50.2	Left	357	358	200	Berm	Fluvial	None	Near	7-10		***CRITICAL*** Slow erosion, but still have significant berm width. No other observed changes.	D3P22
Sacramento	50.4	Left										***CRITICAL*** DID NOT OBSERVE. USACE identified site.	---
Sacramento	51.1	Left		25	110	Toe, Mid-slope	Fluvial	None	In	0		Revised limits - Extended site about 100m further downstream. No observed changes.	D3P20 at U/S end
Sacramento	51.5	Left	270	271	400	Berm, Levee toe	Fluvial		In or near	2		***POSSIBLY CRITICAL*** Several trees at downstream end have root masses almost completely exposed, but have wide berm (>10m) at downstream end as well. No other observed changes.	D3P19
Sacramento	52.3	Left	353	354	237	30	Toe, pocket	Fluvial or tree popout	None	In	2-3	NEW SITE - Small pocket in short berm, but is near or just into toe of projected levee slope. No revetment upstream or downstream. May be part of USACE identified site at RM 52.4.	D3P18

Table 1. Sacramento River Levee System - Current Erosion Sites

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #	
Sacramento	53.1	Left	355		20	Levee slope (upper) and toe	Fluvial	None (Rock riprap U/S and D/S)	In	0-10	No observed changes. Stone bench exposed at waterline.	***POTENTIALLY CRITICAL***	D3P16	
Sacramento	53.5	Right	23	5	50	Whole Bank	Fluvial	Concrete Rubble Toe, Old Cobbles above	In	2	No significant change.		D3P15	
Sacramento	54.5	Right		235	30	Toe	Fluvial	Riprap	In		<u>NEW SITE</u> - Rock riprap covers levee slope, but is sliding off hard, cohesive, near-vertical toe. Unclear whether tree came out at one spot. Erosion of toe is slow.		D3P14	
Sacramento	55.2	Left	353	354	2200	Toe	Fluvial	Old Cobbles	In	0-5	Revised river mile. No significant change. Still have pockets of erosion, but rock bench at waterline is still present.		See 2004 D3P12	
Sacramento	55.5	Left			115	Levee slope	Mass failure	Rock riprap	In	5	No observed change.		D3P13	
Sacramento	55.8	Right	351	352	260	Levee slope	Fluvial	None	In or near		No significant change, but have more geotextile exposed at upstream end.		D3P11 at U/S end D3P12 at D/S end	
Sacramento	56.5	Right	349	350	115	Berm	Fluvial	Rock riprap	Very close	7	No observed change.		D3P10	
Sacramento	56.6	Left			269	10	Toe, Levee slope	Fluvial, Mass failure	Concrete rubble	Levee is set back	39	No observed change.		D3P9
Sacramento	56.7	Left	347	348	510	Structural problem	Fluvial	Rock, concrete, and cobble	In		Under repair still. Slope toe is protected by riprap with LWD on bench, but upper slope is still unprotected.	***CRITICAL***		
Sacramento	56.8	Right	345	346	225	Toe, Levee slope	Fluvial, shelf retreat	None	In or near	0	Looks worse. Tree has fallen and erosion is into levee toe and possibly as high as mid slope. .	***POTENTIALLY CRITICAL***	D3P6 D3P7 at D/S end	

Table 1. Sacramento River Levee System - Current Erosion Sites

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Sacramento	57	Right		344		50	Toe	Fluvial	None	In		No observed changes.	D3P5
Sacramento	60	Left	337	338		230	Toe, Levee Slope	Fluvial	Concrete Rubble, Coble & Rock	In		Partial Repair - by building oversized levee on landside.	D3P4 view D/S
Sacramento	62.5	Right			334	50	Levee	Fluvial	Rehabilitated cobble with rock riprap	In	0	No observed changes.	D3P3
Sacramento	62.9	Right	332	333		50	Toe	Fluvial	Concrete rubble and cobble	In		No observed changes.	D3P2
Sacramento	63	Right			331	30	Toe	Fluvial	Rock and rubble	In		No observed changes.	D3P1
Sacramento	69.9	Right	325	326		610	Toe, Levee slope	Fluvial	None	In (at U/S end)		***CRITICAL*** No observed changes.	D2P55 at U/S end
Sacramento	70.7	Right	323	324		530	Berm slope	Fluvial	Cobble and rubble	Near	3	No observed changes.	D2P54 at D/S end
Sacramento	71.3	Right	321	322		130	Berm	Scallops	Cobble	Near	8	No observed changes.	D2P53 at D/S end
Sacramento	71.7	Right	319	320		170	Berm	Fluvial	Cobble	Very close	7	***POTENTIALLY CRITICAL*** No observed changes.	D2P52 at D/S end

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River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Sacramento	72.2	Right	317	318	415	Levee toe, Berm slope	Fluvial	None	In (at toe)	4		***CRITICAL*** No observed changes.	D2P521
Sacramento	73	Right			245	15	Levee slope	Scallops	None	Near	0	***POTENTIALLY CRITICAL*** No observed changes. Some sand deposited along toe just downstream.	D2P50
Sacramento	73.5	Left	225	226	300	Full Bank	Fluvial, Mass failure	None	Near	15	Still looks close to being into levee toe. No other observed changes.		D2P49 at middle
Sacramento	74.4	Right	313	314	430	Toe of berm	Toe retreat	None	Near	10-15	Some small pockets in low toe near waterline. No other observed changes.		D2P46 view U/S
Sacramento	75.3	Right	311	312	855	Levee toe, Berm slope	Mass failure, Toe erosion	None	Near	10-15	Lots of small trees down along bank at upstream end. No other observed changes.		D2P45 at D/S end D2P44 at U/S end
Sacramento	77.2	Left	10	11	95	Toe	Fluvial	Concrete rubble	In	10	Site is staked and rock riprap is stockpiled along the top of bank. No other observed changes.		D2P43
Sacramento	78	Left	307	308	335	Berm or Levee slope	Fluvial	None	In or near	3	***POTENTIALLY CRITICAL*** Site is staked and rock riprap is stockpiled along the top of bank. No other observed changes.		D2P42
Sacramento	78.3	Left	305	306	175	Toe of berm	Fluvial	None	Near	5	Site is staked and rock riprap is stockpiled along the top of bank. No other observed changes.		D2P41
Sacramento	78.8	Left	301	302	195	Toe, Berm slope	Fluvial, slow retreat of levee/berm ? slope	None	In or very close	11	Site is staked and rock riprap is stockpiled along the top of bank. No other observed changes.		D2P40 view D/S
Sacramento	85.6	Right	36	35	130	Toe	Toe scour	Cobble	In	0	***CRITICAL- 42F SITE*** No observed changes.		D2P39 at U/S end

Table 1. Sacramento River Levee System - Current Erosion Sites

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #	
Sacramento	86	Left	38	37	500	Toe	Toe scour	Cobble	Near	0-10	No observed changes.	D2P38 view U/S		
Sacramento	92.8	Left	43	42	245	Toe	Toe scour	Cobble	In	0-5	No observed changes. Still pretty minor site.	D2P37 view D/S		
Sacramento	93.7	Left	45	44	255	Toe, Levee slope	Fluvial, Mass failure	None	Near	5	No observed changes. Lots of berm.	D2P36 view D/S		
Sacramento	95.8	Left	481	479	345	Berm		Concrete rubble, rock, bricks, and steel	Near	12	No observed changes.	D2P35 at D/S end		
Sacramento	96.2	Left	483	482	275	Berm	Fluvial	None	Near	10	No observed changes.	D2P33 at U/S end D2P34 view U/S		
Sacramento	99	Left	48	47	330	Berm or Levee slope	Toe scour	Riprap - handplaced	In or near	3	No observed changes.	D2P32 view U/S at middle		
Sacramento	99.3	Right		555	222	30	Whole Bank	Rotational Failure	Rock Riprap	In	4	Recommend upgrade to CRITICAL. Still into mid-slope of levee, but sand deposits and vegetation from last year are gone. No other observed changes.	D2P31 view U/S	
Sacramento	99.5	Right	50	49	310	Levee toe, slope	Toe scour and piping	Riprap - handplaced	In	0	***CRITICAL*** No observed changes.	D2P30 view D/S		
Sacramento	101.3	Right	485	484	65	Toe	Toe Scour	Cobble	In		No observed changes.	D2P29 view U/S		
Sacramento	104	Left	492	491	1065	Levee toe, Berm slope	Pocket erosion	Cobble	In or near	11	No observed changes. Still have multiple pockets in toe.	D2P26 view D/S at U/S end D2P27 view U/S at D/S end		

Table 1. Sacramento River Levee System - Current Erosion Sites

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Sacramento	104.5	Left	494	493		260	Levee toe, Berm slope	Fluvial	Cobble	In or near	12	No observed changes.	D2P25 view D/S at U/S end
Sacramento	116	Left	22	1		200	Toe and Berm	Fluvial	None	Near	10	No observed changes.	D2P24 view D/S
Sacramento	116.5	Left	502	501		1125	Berm	Localized mass failures	None	In or Near	3	No observed changes.	D2P21 view D/S D2P22 view at middle D2P23 view D/S at D/S end
Sacramento	122	Right			267	30	Lower bank	Mass failure		Near	12	No observed changes.	D2P20
Sacramento	122.3	Right	19	507		100	Whole Bank	Toe scour	None	Near	12	Scallop in bank at upstream end looks worse. No other observed changes.	D2P18 at U/S end D2P 19 at D/S end
Sacramento	123.5	Left			171	100	Toe	Mass failure, scour	None	In	0	Still steep levee slope with no berm. And erosion into levee toe and mid-slope. No other observed changes.	***CRITICAL - 42F SITE*** D2P17
Sacramento	123.7	Right			172	40	Toe	Toe scour	Concrete rubble	Near	5	No observed changes.	D2P16 view U/S
Sacramento	127.9	Right			266	15	Whole bank	Scour		Near	11	No observed changes.	D2P14 at U/S end
Sacramento	130	Left	18	174		170	Levee Toe, Berm Slope	Fluvial	Cobble	In or near	0-20	Trees look okay and downstream end has some new riprap repair. Site is no longer critical and was removed from that listing.	*** 42F SITE*** D2P13

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River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #	
Sacramento	130.8	Right			175	60	Toe, Levee slope	Toe scour	Cobble	In	0	***CRITICAL*** No observed changes.	D2P12	
Sacramento	132	Left			221	50	Toe	Eddy erosion	None	In or near	7	NEW SITE - On inside of bend. Erosion of berm toe. Levee slope is steep. Erosion probably due to eddy scour off upstream cobble riprap.	D2P11	
Sacramento	133	Left	177	176		280	Toe	Toe scour	Cobble and concrete rubble	Near	10	No observed changes.	D2P9 at U/S end D2P10 at D/S end	
Sacramento	133.8	Left			178	30	Toe	Toe scour	Cobble	In		No observed changes. Still small scallops.	D2P8 view U/S	
Sacramento	135.3	Right	516	515		970	Toe	Recession	None	Levee is setback	60	No observed changes. Still has large berm.	D2P7 view U/S	
Sacramento	136.6	Left	180	179		115	Toe	Toe scour	Cobble	In		No observed changes.	D2P6	
Sacramento	136.7	Right			518	30	Pocket, Toe	Mass failure, Fluvial		Near	10	Scallop look a little rawer. Vertical toe with 8-9 feet of depth at toe. No other significant changes.	D2P4 D2P5 view U/S	
Sacramento	136.9	Right				264	40	Whole bank	Fluvial, Mass failure	Cobble upstream	Near	10	No observed change. Still slow with resistant wedge of sediment at toe.	D2P2 view U/S
Sacramento	138.1	Left	182	181		370	Toe	Toe scour	Cobble	In		No observed change.	D2P1 view U/S	

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River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Sacramento	141.4	Right	185 186	183	263	610	Toe, levee slope	Toe scour, scallops, mass failure	Riprap and cobble	In or near	0	***CRITICAL*** Looks about the same: bad. Some levee work above and silt fences at top of bank at upstream end. Downstream end appears same but old snag from last year is missing.	D1P31 & D1P32 at U/S end D1P33 at D/S end
Sacramento	145.9	Left			369	100	Whole Bank	Fluvial, mass failure	None	In	2	NEW SITE ***CRITICAL*** Currently staked and being monitored by DWR. Vertical bank that has recently lost considerable vegetative cover and erosion is now at or into the levee toe. Large mass failure of bank in future could be problematic.	D1P27 D1P28
Sacramento	154.5	Right	251	16		65	Partially Repaired	Partially Repaired	Cobbles, emergency riprap	Near	7	***CRITICAL*** Currently being REPAIRED. Repairs consist of rock toe/bench with soil fill behind and vegetative sprigging in soil lifts. Large logs (LWD) have been driven into toe area and extend out into water for short distance (probably as fish habitat). STILL CRITICAL since repairs may not be adequate for bank/levee protection. Should continue to monitor this site after repairs are completed.	D1P20, 21, 22, 23 at U/S end D1P24 at D/S end
Sacramento	157.7	Right	204	205		350	Full Bank	Fluvial, Mass Failure	None	Near	15	Erosion is close to levee toe but not into levee section yet. No other significant changes	D1P19
Sacramento	163	Left	260	261		340	Whole bank	Fluvial			20(?)	No observed changes.	D1P17 view D/S
Sacramento	164	Right	194	193		150	Toe	Toe scour	None	In	0	***CRITICAL - 42F SITE*** No observed changes. Still into levee toe.	D1P14
Sacramento	168.3	Left	195	17		120	Berm slope	Toe scour	None	Near	9	No observed changes.	D1P13

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River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Sacramento	177.8	Right	197	196		410	Toe	Toe scour	Cobble	In		Upper bank washout appears to be a worse problem, not just toe. No other observed changes.	D1P7 view D/S D1P8
Sacramento	182	Right	255	256		390	Toe, Lower bank slope	Fluvial, Mass failure	Cobbles	Near	30	Upstream end appears about the same, but downstream end looks worse due to vertical face.	D1P4, view D/S D1P5 at D/S end D1P6 at D/S end
Steamboat	16.2	Right			342	30	Whole Bank	Dry ravel, Wave wash	Riprap	In	0	Whole sandy levee slope is eroding, is burned, and is near vertical. Little or no rock remains on slope and only a minimal amount remains along toe.	D3P64
Steamboat	16.6	Right			142	125	Levee slope	Fluvial, wavewash	Riprap	In		No observed changes (stake in ground at downstream scallop)	D3P65 at D/S end
Steamboat	18.8	Right			282	160	Levee slope, toe	erosion above riprap	Riprap	In	0	No observed changes.	D4P62
Steamboat	22.7	Right			155	15	Levee slope	Fluvial	None	In		No observed changes.	D4P61
Steamboat	23.2	Left			8	75	Whole Bank	Partially Repaired	Intermittent Concrete Rubble	In	0	No observed changes.	D4P60
Steamboat	23.9	Right	161	160		45	Partially Repaired	Partially Repaired	None	In		No observed changes.	D4P59
Steamboat	24.7	Right	163	162		100	Partially Repaired	Partially Repaired	Riprap	In		Revised - Only the middle 150-200 feet are eroding. No other observed changes.	D4P58

Table 1. Sacramento River Levee System - Current Erosion Sites

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Steamboat	25	Left	165	164		105	Partially Repaired	Partially Repaired	None	In		One new small tree has fallen. No other observed changes.	D4P57
Steamboat	26	Left	285	286		100	Berm slope, Toe	Mass failure, Wave wash		In	2	One new small tree has fallen. No other observed changes.	D4P56
Sutter	24.7	Right	166	54		710	Partially Repaired	Partially Repaired	Riprap, dumped from top of bank	In		No observed changes.	D4P3 at D/S end
Sutter	24.8	Left	166	167		275	Levee slope	Mass Failure, Scallops	None	In		No observed changes.	D4P2 at D/S end D4P4 at U/S end
Sutter	25.4	Right	53	550		Unknown	Toe, Berm slope	Slumping	None	In	0-5	Some fresh/clean faces on scallops with a fair amount of berms at mid slope. No other observed changes.	D4P5 at D/S end D4P6 at U/S end
Sutter	26.5	Left	52	51		1 site @ 30m & 2 sites @ 10m	Toe	Toe unraveling	Rock Riprap	In	0	Still looks bad with exposed geotextile fabric. No other observed changes.	D4P7 at D/S end

Table 2. Sacramento River Levee System - Newly Identified Erosion Sites

2005 SACRAMENTO RIVER RECONNAISSANCE EROSION INVENTORY**2005 SITES NEWLY IDENTIFIED TO DATABASE**

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Cache Slough	15.5	Left		366	10	Scallop	Wave wash	New stone failing in places	In	1-2	NEW SITE - Large vertical sections due to wave wash. New stone dumped on bank with geotextile exposed. Cohesive toe has thin weak stratigraphic unit that is washing out. Poor design/construction of stone revetment.	D4P13
Cache Slough	15.9	Left	364	365	300	Toe	Wave wash	New stone failing in places	In	1-2	NEW SITE - Large vertical sections due to wave wash. New stone dumped on bank with geotextile exposed. Cohesive toe has thin weak stratigraphic unit that is washing out.	D4P11 D4P12
Cache Slough	23.6	Right		135	400	Scallops and toe	Wave wash and geotechnical failures	None	In	0	NEW SITE (This site appears on atlas and waypoint is in GPS , but is not in inventory - need to put back into inventory)	D4P10 at D/S end
Sacramento	35.4	Right		273	100	Pocket, Toe	Wave wash, Tree popouts	Riprap	In		NEW SITE - Three pockets of erosion into levee section due to popouts or mass failures. Stone is present along waterline. Riprap is present upstream and downstream of site.	D3P40
Sacramento	47.0	Left		246	300	Toe, berm	Fluvial, wave wash	None	In	2-3	NEW SITE - Long reach with eroding vertical silty-sandy berm. Erosion may be into levee toe. No riprap at site but have cobble riprap upstream and rock riprap downstream. Site is just downstream of a stormwater outfall.	D3P27 view D/S
Sacramento	50	Left		239	approx. 450	Toe, berm, pockets	Fluvial, wave wash	None	Near	9-10	NEW SITE - Eroding wide, sandy-silty berm with vertical face in places and erosion pockets into the berm. There is no revetment in the reach, but there is lots of woody debris along the waterline. Apparent reach = RM 50.2 - RM 49.9.	D3P21
Sacramento	52.3	Left		237	30	Toe, pocket	Fluvial or tree popout	None	In	2-3	NEW SITE - Small pocket in short berm, but is near or just into toe of projected levee slope. No revetment upstream or downstream. May be part of USACE identified site at RM 52.4.	D3P18
Sacramento	54.5	Right		235	30	Toe	Fluvial	Riprap	In		NEW SITE - Rock riprap covers levee slope, but is sliding off hard, cohesive, near-vertical toe. Unclear whether tree came out at one spot. Erosion of toe is slow.	D3P14
Sacramento	132	Left		221	50	Toe	Eddy erosion	None	In or near	7	NEW SITE - On inside of bend. Erosion of berm toe. Levee slope is steep. Erosion probably due to eddy scour of upstream cobble riprap.	D2P11
Sacramento	145.9	Left		369	100	Whole Bank	Fluvial, mass failure	None	In	2	NEW SITE ***CRITICAL*** Currently staked and being monitored by DWR. Vertical bank that has recently lost considerable vegetative cover and erosion is now at or into the levee toe. Large mass failure of bank in future could be problematic.	D1P27 D1P28
Steamboat	16.2	Right		342	30	Whole Bank	Dry ravel, Wave wash	Riprap	In	0	Whole sandy levee slope is eroding, is burned, and is near vertical. Little or no rock remains on slope and only a minimal amount remains along toe.	D3P64

Table 3. Sacramento River Levee System - Removed Erosion Sites

2005 SACRAMENTO RIVER RECONNAISSANCE EROSION INVENTORY

SITES REMOVED FROM DATABASE IN 2005

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Georgiana Slough	1.2	Left	437	436		140	Toe, Levee slope	Pocket erosion and scour	Rock riprap	In		<u>REPAIRED - REMOVE</u>	D4P18
Georgiana Slough	4.6	Right	463	462		205	Toe	Erosion pockets	None	In		<u>REPAIRED - REMOVE</u>	D4P34
Georgiana Slough	9.1	Left	389	390		85	Repaired	Repaired	None	In		<u>REPAIRED - REMOVE</u>	D4P49
Lower American	1.8	Left					Toe	toe erosion, upper slope failure				<u>REPAIRED - REMOVE</u>	
Lower American	4.2	Left					Levee Slope	erosion of waterside slope				<u>REPAIRED - REMOVE</u>	
Lower American	6.4	Left					Levee Slope	erosion of waterside slope				<u>REPAIRED - REMOVE</u>	
Lower American	6.9	Left					Levee Slope	erosion of waterside slope				<u>REPAIRED - REMOVE</u>	
Lower American	7	Right					Overbank, Toe	erosion of overbank at toe of levee and levee waterside slope				<u>REPAIRED - REMOVE</u>	
Lower American	7.3	Right					Overbank	Potential for large overbank scour hole				<u>REPAIRED - REMOVE</u>	
Lower American	10	Left					Slope, Toe	slope and toe erosion, then slope failure				<u>REPAIRED - REMOVE</u>	
Lower American	10.2	Right					Overbank, Levee Slope	erosion of overbank and waterside levee slope				<u>REPAIRED - REMOVE</u>	
Sacramento	11	Left				15	50	Whole Bank	Wave Wash and Slumping	Rock Riprap at beach margin	In	<u>REPAIRED - REMOVE</u>	D4P14

Table 3. Sacramento River Levee System - Removed Erosion Sites

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #	
Sacramento	26.1	Right	101	100	95	Levee slope	Fluvial	Riprap	In			<u>REPAIRED - REMOVE</u>	D3P50	
Sacramento	26.4	Right		275	150	Middle, Toe	Wave wash, Slope failure	None	In	0	No observed change.	RECOMMEND REMOVING	D3P49 just D/S of WPT D3P48 at old site	
Sacramento	31.4	Right	233	362	140	Toe, Partially Repaired	Partially Repaired	Rock Riprap	In			<u>REPAIRED - REMOVE</u>	D3P44 view U/S	
Sacramento	50.8	Left			1000	Berm, Levee toe	Cobbles			0	Does not appear to be a critical site nor a problem site.	RECOMMEND REMOVING	No Photo	
Sacramento	52.4	Left										<u>REPAIRED - REMOVE</u>	D3P17	
Sacramento	74	Right	315	316	1215	Berm	Deep-seated rotational failure, scallops	None	Near	10-15	No observed changes.	RECOMMEND REMOVING this site since there is 50 to 100 feet of berm and is on inside of bend.	D2P47 view U/S	
Sacramento	125.8	Left			173	50	Levee slope	erosion, high flows	Riprap	In		<u>REPAIRED - REMOVE</u>	D2P15	
Sacramento	164.3	Right			257	30	Whole bank	Fluvial, Mass failure		Near	10	No further erosion activity over the years of observation.	RECOMMEND REMOVING	D1P16

Table 3. Sacramento River Levee System - Removed Erosion Sites

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Sacramento	164.4	Right	258	259		610	Whole bank	Fluvial			6	No further erosion activity over the years of observation. RECOMMEND REMOVING	D1P15 view D/S
Sacramento	192.4	Left	249	252	248	290	Whole bank	Mass failure	Private levee is set back	10	No observed changes except a small bit of erosion on the backside of the bar. RECOMMEND REMOVING - This site is above the limits of the flood control project.	D1P1 view D/S	

Table 4. Sacramento River Levee System - Potentially Critical and Critical Erosion Sites

2005 SACRAMENTO RIVER RECONNAISSANCE EROSION INVENTORY**SITES POTENTIALLY CRITICAL & CRITICAL FROM DATABASE IN 2005**

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Bear	2.4	Left	115*	114*	152	152	Berm	Toe Erosion, Upper Bank Slope	None	Near	50	***CRITICAL*** DID NOT OBSERVE. (2002 Note: Part of existing site; Sandy banks are actively eroding and has worsened since last year.)	---
Bear	10.1	Right	116*	117*	213	213	Berm	Toe Erosion, Upper Bank Slope	None	Near	0	DID NOT OBSERVE. (2002 Note: No berm; 1; 1 OR 1.5:1 slope from toe of levee to river bottom; No rock protection.)	---
Cache Creek	LM 0.8	Left	76*	350	Bank Slope	350	Toe Erosion, Upper Bank Collapse	None	Near	60	DID NOT OBSERVE. (2002 Note: Erosion extends 150' US and 200' DS of Wpt.)	---	
Cache Creek	LM 1.1	Left	85*	525	Bank Slope	525	Toe Erosion, Upper Bank Collapse	None	Near	90	DID NOT OBSERVE. (2002 Note: Erosion extends 150' US and 375' DS of Wpt.)	---	
Cache Creek	LM 2.4	Left	86*	570	Bank Slope	570	Toe Erosion, Upper Bank Collapse	None	Near	90	DID NOT OBSERVE. (2002 Note: Erosion extends 240' US and 3300' DS of Wpt.)	---	
Cache Slough	21.8	Right	551	552	485	485	Whole Bank and toe	Rotational failure, fluvial toe erosion	None	In	0	Reach is not 485m long, mainly numerous small pockets. Still looks bad. No grass on levee slopes now (has been graded).	D4P9 at 10m pocket at WPT
Feather	17.8	Left	553	75-100	Whole Bank	75-100	Fluvial, Slope failures	None	Near	>50	Some new slumping. Actively eroding wide berm which is >50 feet wide.	D5P6 D5P7	
Feather	19.7	Left	554	100	Whole Bank	100	Fluvial, Slope failures	None	Near	>50	Some new slumping. Actively eroding wide berm which is >50 feet wide.	D5P8	
Sacramento	20.8	Left	472	473	120	120	Partially Repaired	Partially Repaired	None	In		***POTENTIALLY CRITICAL*** No observed changes (large berm)	D3P62 at U/S end
Sacramento	26.5	Left	103	102	140	140	Toe, Levee slope	Toe scour	Riprap	In		***POTENTIALLY CRITICAL*** No observed changes.	D3P 46 at U/S end D3P47 at D/S end
Sacramento	26.9	Left	105	104	85	85	Toe	Toe scour	Cobble	In	0	Currently trimming trees and clearing bank. Still looks bad.	D3P45

2005 SACRAMENTO RIVER RECONNAISSANCE EROSION INVENTORY

Table 4. Sacramento River Levee System - Potentially Critical and Critical Erosion Sites

SITES POTENTIALLY CRITICAL & CRITICAL FROM DATABASE IN 2005

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Sacramento	32.5	Right	276	277		565	Toe, Levee slope	Fluvial, Mass failure	Intermittent rock riprap, concrete rubble	In	0	***CRITICAL*** worse at the upstream end because of road work along the top of the slope. Downstream end appears about the same. No other observed changes at downstream end.	D3P42 at U/S end
Sacramento	34.5	Right	231	232		130	Partially Repaired	Partially Repaired	Concrete rubble	In		***CRITICAL*** Upstream end has been repaired, but rock is sliding off the cohesive bench at the waterline. Downstream end is not repaired.	See 2004 D3P34
Sacramento	49.6	Left			39	50	Toe, Berm	Fluvial	None	Near	3	***CRITICAL*** No observed changes.	See 2004 D3P21
Sacramento	49.9	Left			198	10	Repaired	Repaired	Riprap	In		***CRITICAL*** No observed changes. Consists mainly of undercut trees with rock riprap upstream and downstream.	D3P23
Sacramento	50.2	Left	357	358		200	Berm	Fluvial	None	Near	7-10	Slow erosion, but still have significant berm width. No other observed changes.	D3P22
Sacramento	50.4	Left										***CRITICAL*** DID NOT OBSERVE. USACE identified site.	---
Sacramento	51.5	Left	270	271		400	Berm, Levee toe	Fluvial		In or near	2	Several trees at downstream end have root masses almost completely exposed, but have wide berm (>10m) at downstream end as well. No other observed changes.	D3P19
Sacramento	53.1	Left			355		Levee slope (upper) and toe	Fluvial	None (Rock riprap U/S and D/S)	In	0-10	***POTENTIALLY CRITICAL*** No observed changes. Stone bench exposed at waterline.	D3P16

Table 4. Sacramento River Levee System - Potentially Critical and Critical Erosion Sites

2005 SACRAMENTO RIVER RECONNAISSANCE EROSION INVENTORY**SITES POTENTIALLY CRITICAL & CRITICAL FROM DATABASE IN 2005**

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Sacramento	56.7	Left	347	348	510	Structural problem	Fluvial	Rock, concrete, and cobble	In			***CRITICAL*** PLANS AND SPEC'S DEVELOPED Under repair still. Slope toe is protected by riprap with LWD on bench, but upper slope is still unprotected.	D3P7 D3P7 at D/S end
Sacramento	56.8	Right	345	346	225	Toe, Levee slope	Fluvial, shelf retreat	None	In or near	0		***POTENTIALLY CRITICAL*** Looks worse. Tree has fallen and erosion is into levee toe and possibly as high as mid slope.	D3P6 D3P7 at U/S end
Sacramento	69.9	Right	325	326	610	Toe, Levee slope	Fluvial	None	In (at U/S end)			***CRITICAL*** No observed changes.	D2P55 at U/S end
Sacramento	71.7	Right	319	320	170	Berm	Fluvial	Cobble	Very close	7		***POTENTIALLY CRITICAL*** No observed changes.	D2P52 at D/S end
Sacramento	72.2	Right	317	318	415	Levee toe, Berm slope	Fluvial	None	In (at toe)	4		***CRITICAL*** No observed changes.	D2P521
Sacramento	73	Right			245	15	Levee slope	Scallops	None	Near	0	***POTENTIALLY CRITICAL*** Some sand deposited along toe just downstream.	D2P50
Sacramento	78	Left	307	308	335	Berm or Levee slope	Fluvial	None	In or near	3		***POTENTIALLY CRITICAL*** Site is staked and rock riprap is stored along the top of bank. No other observed changes.	D2P42
Sacramento	85.6	Right	36	35	130	Toe	Toe scour	Cobble	In	0		***CRITICAL - 42F SITE*** No observed changes.	D2P39 at U/S end

2005 SACRAMENTO RIVER RECONNAISSANCE EROSION INVENTORY

Table 4. Sacramento River Levee System - Potentially Critical and Critical Erosion Sites

SITES POTENTIALLY CRITICAL & CRITICAL FROM DATABASE IN 2005

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Sacramento	99.3	Right		555	222	30	Whole Bank	Rotational Failure	Rock Riprap	In	4	Recommend upgrade to CRITICAL. Still into mid-slope of levee and sand deposits and vegetation from last year are gone. No other observed changes.	D2P30 view D/S
Sacramento	99.5	Right	50	49		310	Levee toe, slope	Toe scour and piping	Riprap - handplaced	In	0	***POTENTIALLY CRITICAL*** No observed changes.	D2P29 view D/S
Sacramento	123.5	Left			171	100	Toe	Mass failure, scour	None	In	0	***CRITICAL - 42F SITE*** Still steep levee slope with no berm. And erosion into levee toe and mid-slope. No other observed changes.	D2P17
Sacramento	130.8	Right			175	60	Toe, Levee slope	Toe scour	Cobble	In	0	***CRITICAL*** No observed changes.	D2P12
Sacramento	141.4	Right	185 186	183	263	610	Toe, levee slope	Toe scour, scallops, mass failure	Riprap and cobble	In or near	0	Looks about the same: bad. Some levee work above and silt fences at top of bank at upstream end. Downstream end appears same but old snag from last year is missing.	D1P31 & D1P32 at U/S end D1P33 at D/S end
Sacramento	145.9	Left			369	100	Whole Bank	Fluvial, mass failure	None	In	2	NEW SITE ***CRITICAL*** Currently staked and being monitored by DWR. Vertical bank that has recently lost considerable vegetative cover and erosion is now at or into the levee toe. Large mass failure of bank in future could be problematic.	D1P27 D1P28
Sacramento	154.5	Right	251	16		65			Partially Repaired			***CRITICAL*** Currently being REPAIRED. Repairs consist of rock toe/bench with soil fill behind and vegetative sprigging in soil lifts. Large logs (LWD) have been driven into toe area and extend out into water for short distance (probably as fish habitat). STILL CRITICAL since repairs may not be adequate for bank/levee protection. Should continue to monitor this site after repairs are completed.	D1P20, 21, 22, 23 at U/S end D1P24 at D/S end

Table 4. Sacramento River Levee System - Potentially Critical and Critical Erosion Sites

2005 SACRAMENTO RIVER RECONNAISSANCE EROSION INVENTORY**SITES POTENTIALLY CRITICAL & CRITICAL FROM DATABASE IN 2005**

River	River Mile	Bank	U/S WPT	D/S WPT	Mid WPT	Est. Length (m)	Erosion Location	Erosion Mechanism	Revetment Type	Proximity to Levee	Min. Berm Width (m)	2005 Recon Comments	2005 Photo #
Sacramento	164	Right	194	193		150	Toe	Toe scour	None	In	0	***CRITICAL - 42F SITE*** No observed changes. Still into levee toe.	D1P14
Steamboat	16.2	Right			342	30	Whole Bank	Dry ravel, Wave wash	Riprap	In	0	NEW SITE ***CRITICAL*** Whole sandy levee slope is eroding, is burned, and is near vertical. Little or no rock remains on slope and only a minimal amount remains along toe.	D3P64

2005 SACRAMENTO RIVER RECONNAISSANCE EROSION INVENTORY

Table 5. Sacramento River Levee System - Waypoint Locations

2005 Waypoint Locations

River	River Mile	Bank	U/S WPT	Upstream Wpt		D/S WPT	Downstream Wpt		Mid WPT	Northing	Middle Wpt	Easting
				Northing	Easting		Northing	Easting				
Bear	2.4	Left	115*	38.95898	121.54699	114*	38.95628	121.54794				
Bear	9.9	Right	117*	38.99522	121.42987	118*	38.99439	121.4334				
Bear	10.1	Right	116*	38.9955	121.42967	117*	38.95898	121.54699				
Cache Creek	LM 0.8	Right	75*	38.73206	121.79795	72*	38.76204	121.79708				
Cache Creek	LM 0.8	Left							76*	38.71782	121.81584	
Cache Creek	LM 1.1	Left							85*	38.7212	121.81223	
Cache Creek	LM 1.8	Right	68*	38.73232	121.78609	63*	38.7294	121.78508				
Cache Creek	LM 2.4	Left							86*	38.73326	121.79893	
Cache Creek	LM 2.8	Left	87*	38.73418	121.79346							
Cache Creek	LM 3.4	Left							106	38.73262	121.78493	
Cache Creek	LM 3.6	Right							62*	38.72293	121.75972	
Cache Creek	LM 3.9	Left							107*	38.72793	121.78054	
Cache Creek	LM 4.2	Left							112*	38.72725	121.7752	
Cache Slough	15.5	Left							366	38.1955333	121.6555	
Cache Slough	15.9	Left	364	38.2000333	121.6560166	365	38.1972166	121.6558833				
Cache Slough	21.8	Right	551	N38.27250000	W121.70870000	552	N38.269352000	W121.70460000	363	38.2695	121.7044333	
Cache Slough	23.6	Right							135	N38.28838061	W121.72419592	
Elk Slough		Both							40 &	N38.33565193	W121.58325380	
Feather	0.6	Left							522	N38.79311785	W121.62820349	
Feather	1	Left	531	N38.80096450	W121.633310677				532	N38.79792991	W121.63283637	
Feather	3.5	Left							217	N38.83283	W121.63375	
Feather	5	Left	13	N38.85366289	W121.62930313	12	N38.85230115	W121.62960958	60	N38.85105171	W121.63000617	
Feather	7	Left	526	N38.87969924	W121.61221377				525	N38.87859763	W121.61263740	
Feather	17.8	Left							553	N39.00848	W121.57933	
Feather	19.7	Left							554	N39.02258	W121.59358	
Feather	37.9	Right										
Georgiana Slough	0.3	Left	432	N38.13003409	W121.58657072	431	N38.13033187	W121.58226233				
Georgiana Slough	1.2	Left	437	N38.13895279	W121.59635023	436	N38.1376814	W121.59566522				
Georgiana Slough	1.7	Left	441	N38.14355351	W121.59978433	440	N38.14025010	W121.59705328				
Georgiana Slough	2.3	Left	444	N38.15110259	W121.59596266	442	N38.14593528	W121.60068567	443	N38.1519473684	W121.59786448	
Georgiana Slough	2.5	Left	446	N38.15088287	W121.593373636	445	N38.1518056	W121.59120360				
Georgiana Slough	3.6	Left	450	N38.15614906	W121.59173539	449	N38.15296671	W121.59140189				
Georgiana Slough	3.7	Left	452	N38.15686489	W121.59118557	451	N38.15660266	W121.59140189				
Georgiana Slough	3.7	Left							453	N38.15708460	W121.59068082	
Georgiana Slough	4	Left	455	N38.15708460	W121.58743601	454	N38.15723344	W121.58896828				
Georgiana Slough	4.3	Left	458	N38.15991950	W121.58524576	456	N38.15766576	W121.58653467	457	N38.15893439	W121.58578656	
Georgiana Slough	4.5	Left	460						459	N38.1616847	W121.58461482	
Georgiana Slough	4.6	Left	461	N38.1644346	W121.58311860	460	N38.16200309	W121.58439850				
Georgiana Slough	4.6	Right	463	N38.16505040	W121.58347012	462	N38.16328581	W121.58411909				
Georgiana Slough	5.3	Left	465	N38.17609760	W121.58016222	464	N38.16793459	W121.58166745				
Georgiana Slough	6.1	Left	416	N38.18216966	W121.57004921	417	N38.18146825	W121.57623239				
Georgiana Slough	6.4	Left	413	N38.18336701	W121.56794910	415	N38.18298442	W121.56858904				
Georgiana Slough	6.6	Left	411	N38.18558453	W121.56331622	412	N38.18516653	W121.56459612				

2005 SACRAMENTO RIVER RECONNAISSANCE EROSION INVENTORY

Table 5. Sacramento River Levee System - Waypoint Locations

2005 Waypoint Locations

River	River Mile	Bank	U/S WPT	Upstream Wpt		D/S WPT	Downstream Wpt		Mid WPT	Northing	Easting	Middle Wpt
				Northing	Easting		Northing	Easting				
Georgiana Slough	6.8	Left	409	N38.18791533	W121.55888164	410	N38.18601669	W121.56176592				
Georgiana Slough	7	Right	407	N38.18970058	W121.55774596	408	N38.18853167	W121.55893572				
Georgiana Slough	7.3	Left	404	N38.19089780	W121.55468141	405	N38.19018230	W121.55633086	403	N38.19424851	W121.55065243	
Georgiana Slough	7.7	Right										
Georgiana Slough	8.1	Right	399	N38.19849865	W121.54606466	400	N38.19789656	W121.54647924				
Georgiana Slough	8.3	Left	397	N38.20080071	W121.54253138	398	N38.20072988	W121.54283784				
Georgiana Slough	8.4	Left	395	N38.20344976	W121.54025100	396	N38.2011945	W121.54180130				
Georgiana Slough	8.7	Left	393	N38.20464675	W121.54062055	394	N38.20438469	W121.54053041				
Georgiana Slough	9.1	Left	389	N38.21053230	W121.53744784	390	N38.21033400	W121.53823200				
Georgiana Slough	9.3	Left	387	N38.21366964	W121.53750192	388	N38.21180000	W121.53563615				
Georgiana Slough	10.3	Left	381	N38.22301714	W121.54221592	382	N38.22289676	W121.54306317				
Georgiana Slough	10.4	Left	379	N38.22354821	W121.53778134	380	N38.22338535	W121.5382945				
Georgiana Slough	10.6	Left	377	N38.22415009	W121.53523055	378	N38.22391642	W121.53624906				
Georgiana Slough	10.9	Left	375	N38.22723020	W121.53133677	376	N38.226664959	W121.53236430				
Georgiana Slough	11.6	Left	373	N38.22988537	W121.52343205	374	N38.22863214	W121.52484715	243	N38.08883653	W121.70699840	
Sacramento	8	Left										
Sacramento	10.8	Left	216	38.13055	121.6876333	214	38.1289166	121.6882166				
Sacramento	20.8	Left	472	N38.19321427	W121.56510087	473	N38.19228627	W121.56786797				
Sacramento	21.5	Left	470	N38.20068738	W121.55777300	471	N38.20027656	W121.55785412				
Sacramento	22.5	Left	293	N38.21330847	W121.55725022	292	N38.21099264	W121.55721417				
Sacramento	22.7	Left	295	N38.21871886	W121.55688807	294	N38.21811694	W121.55692574				
Sacramento	23.2	Left	297	N38.22460326	W121.55580808	296	N38.223332162	W121.55580808				
Sacramento	23.3	Left	299	N38.22723728	W121.55568189	298	N38.226767996	W121.55570893				
Sacramento	24.8	Left	534	N38.24061833	W121.54492894	300	N38.24095813	W121.54660543				
Sacramento	25.2	Left	536	N38.23900424	W121.53719547	56	N38.23940776	W121.53868267	535	N38.23923786	W121.53783542	
Sacramento	26	Left	466	N38.23903256	W121.52296335	467	N38.23796356	W121.52918163				
Sacramento	26.1	Right	101	N38.23974757	W121.52260282	100	N38.2359891	W121.52364837	275	N38.2397833	W121.5199	
Sacramento	26.4	Right										
Sacramento	26.5	Left	103	N38.24148200	W121.51510369	102	N38.24046967	W121.51603207				
Sacramento	26.9	Left	105	N38.24446935	W121.51214730	104	N38.24386764	W121.512171515				
Sacramento	31.4	Right	233	N38.29310630	W121.56356860	362	N38.29213006	W121.56266726				
Sacramento	31.6	Right	236	N38.29583687	W121.56625458	238	N38.29417449	W121.56462316				
Sacramento	32.5	Right	276	N38.30991254	W121.57712471	277	N38.30545672	W121.57412326				
Sacramento	33	Right										
Sacramento	34.5	Right	231	N38.33603371	W121.56820147	232	N38.33503684	W121.56896761	274	N38.3135666	W121.57781500	
Sacramento	35.4	Left	250			247/55	N38.34270000	W121.57567000	273	N38.3436166	W121.5594000	
Sacramento	38.5	Right	219	N38.37171411	W121.52313460	218	N38.37091560	W121.52298138				
Sacramento	41.9	Right	360	N38.41768112	W121.52486517	215	N38.41448196	W121.52270196				
Sacramento	43.3	Right	210	N38.43513625	W121.52984957	213	N38.43276396	W121.53259865				
Sacramento	43.7	Right	208	N38.43538336	W121.52326881	209	N38.43575050	W121.52680305				
Sacramento	44.7	Right	206	N38.43850393	W121.50636072	207	N38.43626589	W121.51136314	246	N38.4706666	W121.5047166	
Sacramento	47	Left										
Sacramento	47.9	Right	202	N38.47353400	W121.52052073							

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Table 5. Sacramento River Levee System - Waypoint Locations

2005 Waypoint Locations

River	River Mile	Bank	U/S WPT		Upstream Wpt		D/S WPT		Downstream Wpt		Mid WPT	Northing	Easting	Middle Wpt
			WPT	Northing	Easting	WPT	Northing	Easting	WPT	Northing				
Sacramento	48.2	Right									201	N38.47343521		W121.52413509
Sacramento	49.6	Left									39	N38.48038556		W121.54565902
Sacramento	49.7	Left									359	N38.48150038		W121.54651529
Sacramento	49.9	Left									198	N38.48394868		W121.54811967
Sacramento	50	Left									239	N38.4869333		W121.55066666
Sacramento	50.2	Left	357	N38.48969164	W121.55252721	358	N38.48761746	W121.55091382			25	N38.50028739		W121.55842196
Sacramento	51.1	Left												
Sacramento	51.5	Left	270	N38.50664974	W121.55663731	271	N38.50313712	W121.55753865						
Sacramento	52.3										237	N38.5151500		W121.54486666
Sacramento	53.1	Left												
Sacramento	53.5	Right	23	N38.52095944	W121.52477504	5	N38.51991575	W121.52500939			235	N38.5285000		W121.5314833
Sacramento	54.5	Right												
Sacramento	55.2	Left	353	N38.53673278	W121.51641063	354	N38.53608415	W121.51703255						
Sacramento	55.8	Right	351	N38.54326815	W121.51223744	352	N38.54121666	W121.51333707						
Sacramento	56.5	Right	349	N38.55131846	W121.51426545	350	N38.55036685	W121.51398603			269	N38.55209383		W121.51281429
Sacramento	56.6	Left												
Sacramento	56.7	Left	347	N38.55738026	W121.51475217	348	N38.55305247	W121.51320187						
Sacramento	56.8	Right	345	N38.55626662	W121.51577969	346	N38.55436352	W121.51514876						
Sacramento	57	Right									344	N38.55778202		W121.51617194
Sacramento	60	Left	337	N38.59329656	W121.50728008	338	N38.59276819	W121.50680237						
Sacramento	62.5	Right									334	N38.59714995		W121.54813770
Sacramento	62.9	Right	332	N38.60160189	W121.55299591	333	N38.60121447	W121.55268044						
Sacramento	63	Right									331	N38.60218653		W121.55371698
Sacramento	69.9	Right	325	N38.66900221	W121.62171387	326	N38.66568050	W121.61639597						
Sacramento	70.7	Right	323	N38.67797428	W121.63155647	324	N38.67387189	W121.62793309						
Sacramento	71.3	Right	321	N38.68410278	W121.63408021	322	N38.68276596	W121.63374672						
Sacramento	71.7	Right	319	N38.69061771	W121.63529702	320	N38.68906994	W121.63509872						
Sacramento	72.2	Right	317	N38.69841935	W121.63066614	318	N38.69536633	W121.63307071						
Sacramento	73	Right									245	N38.70429289		W121.62207440
Sacramento	73.5	Left	225	N38.7102500	W121.6128333	226	N38.7093500	W121.6141166						
Sacramento	74	Right	315	N38.71594709	W121.60908613	316	N38.70770425	W121.618062						
Sacramento	74.4	Right	313	N38.72146758	W121.60618382	314	N38.7171624	W121.60713924						
Sacramento	75.3	Right	311	N38.73645163	W121.60396653	312	N38.72891429	W121.60576921						
Sacramento	77.2	Left	10	N38.76045048	W121.592339027	11	N38.7593519	W121.59233027						
Sacramento	78	Left	307	N38.77091495	W121.59605279	308	N38.76338506	W121.59491711						
Sacramento	78.3	Left	305	N38.77470258	W121.599903622	306	N38.77310744	W121.59796363						
Sacramento	78.8	Left	301	N38.77876404	W121.60284888	302	N38.77758357	W121.60147884						
Sacramento	85.6	Right	36	N38.76671951	W121.69205423	35	N38.7653400	W121.69115289						
Sacramento	86	Left	38	N38.77439339	W121.68615948	37	N38.7750033	W121.69046787						
Sacramento	92.8	Left	43	N38.84045860	W121.72676473	42	N38.83959508	W121.72963999						
Sacramento	93.7	Left	45	N38.85228010	W121.72360103	44	N38.85076553	W121.72383538						
Sacramento	95.8	Left	481	N38.87042971	W121.75240777	479	N38.87228231	W121.74948744						
Sacramento	96.2	Left	483	N38.86932093	W121.75599950	482	N38.87036655	W121.75321898						
Sacramento	99	Left	48	N38.86183975	W121.78407175	47	N38.85841471	W121.78395458						

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2005 Waypoint Locations

Table 5. Sacramento River Levee System - Waypoint Locations

River	River Mile	Bank	Upstream Wpt		Downstream Wpt		Mid WPT	Middle Wpt
			U/S WPT	Northing	Easting	Northing	Easting	Northing
Sacramento	99.3	Right	50	N38.86284337	W121.79222885	555	N38.86365000	W121.78642000
Sacramento	99.5	Right	485	N38.87517339	W121.81354548	49	N38.86306094	W121.79060645
Sacramento	101.3	Right	492	N38.90285025	W121.79084981	484	N38.87496990	W121.81309481
Sacramento	104	Left	494	N38.90677816	W121.79199451	491	N38.9018083	W121.80136842
Sacramento	104.5	Left	22	N39.00114383	W121.80266634	1	N38.90435130	W121.79040815
Sacramento	116	Left	502	N39.00632000	W121.8137000	501	N39.00331522	W121.80518107
Sacramento	116.5	Left						
Sacramento	122	Right	19	N39.06652948	W121.84377633	507	N39.06610259	W121.84274881
Sacramento	122.3	Right						
Sacramento	123.5	Left						
Sacramento	123.7	Right						
Sacramento	125.8	Left						
Sacramento	127.9	Right						
Sacramento	130	Left	18	N39.12212159	W121.90979929	174	N39.12088389	W121.90928553
Sacramento	130.8	Right						
Sacramento	132	Left						
Sacramento	133	Left	177	N39.14258596	W121.93308083	176	N39.14380231	W121.93592906
Sacramento	133.8	Left						
Sacramento	135.3	Right	516	N39.16143001	W121.93468521	515	N39.15966185	W121.93270227
Sacramento	136.6	Left	180	N39.17384783	W121.93868715	179	N39.17288355	W121.93821846
Sacramento	136.7	Right						
Sacramento	136.9	Right						
Sacramento	138.1	Left	182	N39.19315154	W121.93574879	181	N39.19035028	W121.93445087
Sacramento	141.4	Right	185	N39.19268350	W121.98674646	183	N39.19011974	W121.98103198
Sacramento	141.4	Right	186	N39.19363354	W121.98766582			
Sacramento	145.9	Left						
Sacramento	154.5	Right	251	N39.29787051	W122.02677996	16	N39.29794724	W122.02452150
Sacramento	157.7	Right	204	N39.332256	W122.02975	205	N39.33161	W122.02947
Sacramento	163	Left	260	N39.39945212	W122.00359245	261	N39.39654070	W122.00278125
Sacramento	164	Right	194	N39.40698784	W122.00816223	193	N39.40547658	W122.00808111
Sacramento	164.3	Right						
Sacramento	164.4	Right	258	N39.41781639	W122.01037051	259	N39.41243366	W122.00921680
Sacramento	168.3	Left	195	N39.45520547	W121.99429065	17	N39.45312457	W121.99390308
Sacramento	177.8	Right	197	N39.55736427	W122.00356541	196	N39.55386873	W122.00228551
Sacramento	182	Right	255	N39.60633186	W121.99461513	256	N39.60282490	W121.9962511
Sacramento	192.4	Left	249	N39.68975188	W121.94304061	252	N39.68638788	W121.95208102
Steamboat	16.2	Right						
Steamboat	16.6	Right						
Steamboat	18.8	Right						
Steamboat	22.7	Right						
Steamboat	23.2	Left						
Steamboat	23.9	Right	161	N38.27888585	W121.58938290	160	N38.27814999	W121.58999581
Steamboat	24.7	Right	163	N38.28680295	W121.58436245	162	N38.28646336	W121.58481312
Steamboat	25	Left	165	N38.29421693	W121.58246964	164	N38.29130000	W121.58334000

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2005 Waypoint Locations

River	River Mile	Bank	U/S WPT	Upstream Wpt		D/S WPT	Downstream Wpt		Mid WPT	Middle Wpt
				Northing	Easting		Northing	Easting		
Steamboat	26	Left	285	N38.30315090	W121.57744018	286	N38.30257090	W121.57827842		
Sutter	24.7	Right	166	N38.29548317	W121.60500307	54	N38.29075057	W121.60414680		
Sutter	24.8	Left	166	N38.29548317	W121.60500307	167	N38.29314874	W121.60424595		
Sutter	25.4	Right	53	N38.30163015	W121.60022598	550	N38.29947000	W121.60277000		
Sutter	26.5	Left	52	N38.31477120	W121.59184355	51	N38.31415593	W121.59215902		